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Distribution and Natural History Notes of Mammals (Orders: Chiroptera and Rodentia) from Nebraska and South Dakota

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Abstract

Noteworthy distributional and natural history notes are reported for mammals from Nebraska and South Dakota. Such observations are important in understanding distributions of mammals, some of which currently are shifting, as well as understanding their behaviors and ecological relationships between species. Herein, observations are reported for 15 species from two orders of mammals, Chiroptera and Rodentia, including 16 county records and a number of natural history notes. Natural history notes, in part, include a Silver-haired Bat (*Lasionycteris noctivagans*) predated by a Northern Saw-whet Owl (*Aegolius acadicus*), semi-aquatic Common Muskrats (*Ondatra zibethicus*) climbing trees, diurnal observations of Plains Harvest Mice (*Reithrodontomys montanus*), and a Meadow Jumping Mouse (*Zapus hudsonius*) climbing tall grasses to reach seed heads. Distributional records fill in gaps in occurrences of species across two states, whereas natural history observations continue to demonstrate how diverse interactions and behaviors are for mammals in the Great Plains.

Key words: bats, distribution, *Lasionycteris noctivagans*, mammals, natural history, Nebraska, *Ondatra zibethicus*, *Peromyscus leucopus*, range expansion, *Reithrodontomys montanus*, rodents, South Dakota, *Zapus hudsonius*

Introduction

Much information remains to be amassed concerning the distribution and natural history of mammals in the Great Plains. Distributions for many species are shifting because of anthropogenic changes to the region (Benedict et al. 2000; Forrester et al. 2019; Roehrs et al. 2021), whereas other distributional records reflect limited trapping in the past (Benedict 2004; Johnson and Geluso 2017). Many mammals are small and nocturnal, which make them difficult to observe and study. Documenting the natural history of species generally requires time in the field or technological advances in order to study them in their natural habitats (Geluso et al. 2018). Both distributional and natural history information is used to better understand the ecology of species. Accumulation of such data is used for various purposes, such as compiling details of their biology for regional or synoptic books (Schmidly and Bradley 2016; Best and Hunt 2020), review papers (Nyffeler and Knörnschild 2013), and to protect and manage species (USFWS 2015).

Herein, distributional and natural history data are reported for a number of mammals in Nebraska and South Dakota. These observations help to further clarify their distributions and natural history in the Great Plains. Many of these data likely would be difficult to publish individually, thus observations are combined herein to facilitate dissemination of such facts. Unfortunately, there is no specific outlet for short natural history notes and single county records for mammals, like what is available for herpetologists, for example, in the journal *Herpetological Review*. Many data were collected opportunistically while conducting research on other projects. Some data were reported to us by others when they observed something that seemed unusual or of interest.

In accounts below, the focus was to present descriptive data for observations rather than a longer treatise. If relevant, data are presented on methods in accounts, but the intent was to convey new descriptive information. If voucher specimens were secured, individuals were deposited in the natural history collections at the Sternberg Museum of Natural History (FHSM), Hays, Kansas; the University of Nebraska State Museum, Lincoln, Nebraska (UNSM); or the Museum of Southwestern Biology (MSB), University of New Mexico, Albuquerque, New Mexico. For many of the more recent specimens, tissues samples were collected and deposited at the FHSM. Common and scientific names of mammals follow Bradley et al. (2014), unless otherwise noted, whereas common and scientific names of plants follow USDA (2021).

RESULTS

ORDER CHIROPTERA
Family Vespertilionidae
***Lasionycteris noctivagans* (Le Conte, 1831)**
Silver-haired Bat

Silver-haired Bats (*Lasionycteris noctivagans*) occur across Nebraska, with most captures from western parts of the state (Benedict 2004; Johnson and Geluso 2017). For bats, limited data are known regarding predators due to their nocturnal behaviors (Sparks et al. 2000). A number of vertebrates are known to predate *L. noctivagans* in the United States and Canada (Sparks et al. 2000).

In a study of Northern Saw-whet Owls (*Aegolius acadicus*) across Nebraska, Mollhoff (2018) reported on prey items discovered in nest boxes, including a *L. noctivagans*. Limited data were presented for that specific observation by Mollhoff (2018), thus additional data are included here. On 7 October 2014, contents of a nest box were removed and examined for vertebrate remains from the Wildcat Hills State Wildlife Management Area, Scotts Bluff County, Nebraska (4.1 km S, 20.7 km W McGrew Post Office; 41.7094°N, 103.6655°W, elev. 1422 m, WGS 84). The nest box was on a Ponderosa Pine (*Pinus ponderosa*) in a clump of mature pines on the side of a steep gully in rocky escarpment of the Wildcat Hills. In the area, habitat consisted of scattered Ponderosa Pines in a mixed-grass prairie. Examination of prey items from the nest box revealed one *L. noctivagans* (FHSM #43493, partial skull), nine North American Deermice (*Peromyscus maniculatus*), six Prairie Voles (*Microtus ochrogaster*), eight *Microtus* spp., and four harvest mice (*Reithrodontomys* spp.). The nest box contained four owlets on 10 May and the last chick fledged on 29 May. The bat likely was captured during spring migration in April or May, as *L. noctivagans* is not known from the pine forests of the Wildcat Hills in summer (Geluso et al. 2013) and owls generally do not reside in nest boxes after young have fledged (W. Mollhoff, personal communication).

This is the first confirmed occurrence of a Northern Saw-whet Owl predating a Silver-haired Bat in North America. Previously, a small owl, either a Northern Saw-whet Owl or Eastern Screech Owl (*Megascops asio*) was observed to prey upon a *L. noctivagans* in the Black Hills of South Dakota (Mattson 1995). Great Horned Owls (*Bubo virginianus*) also are known to predate *L. noctivagans* (Bond 1940).

***Aeorestes cinereus* (Beauvois, 1796)**
Hoary Bat

The Hoary Bat (*Aeorestes cinereus*, formerly *Lasiurus cinereus*; Baird et al. 2015) is a migratory species that occurs throughout Nebraska (Czaplewski et al. 1979; Benedict 2004). To date, few observa-

tions are known from the Sandhill Region of the state (Czaplewski et al. 1979; Benedict 2004; Johnson and Geluso 2017).

On 25 December 2018, a dead Hoary Bat was observed beneath trees at the headquarters of Fawn Lake Ranch in western Cherry County, Nebraska (46.8 km S, 16.3 km W Merriman, 42.4989°N, 101.9028°W, WGS 84; Fig. 1). It is unknown when the individual died. A number of large Plains Cottonwoods (*Populus deltoides*), other deciduous trees, and coniferous trees were present at the headquarters. The ranch consists almost exclusively of upland grasslands and low-lying wet meadows, with similar habitats surrounding the ranch. Only a limited number of trees occur on the ranch, with no corridors of forested habitats. Riparian habitats along the Niobrara River are about 24 km to the northwest and 29 km to the north. A number of Hoary Bats have been captured along the river throughout the northern tier of the state (Benedict 2004). Only a few records of Hoary Bats are known away from the Niobrara River in the Sandhills (Bogan et al. 2004; Johnson and Geluso 2017). Those records are associated with towns and rivers in Custer County (Czaplewski et al. 1979), a small wooded grove of trees by a wildlife refuge headquarters in Garden County (Bogan et al. 2004), and riparian areas along the Middle Loup River and planted stands of coniferous trees in Thomas County (Geluso 2006).

The record from Fawn Lake Ranch and the observation from Crescent Lake National Wildlife Refuge (Bogan et al. 2004) represent the only records of this species using the vast open areas of the Sandhill Region that lack many trees. It is unknown how many individuals migrate through this region, but farther to the west in wooded habitats of Wildcat Hills and Pine Bluffs areas of Nebraska, migratory waves of individuals frequently have been documented (Geluso et al. 2013; Geluso and Geluso 2016). Documenting Hoary Bats across the Sandhill Region with mist nets likely will prove difficult, but acoustic monitoring could facilitate obtaining such data. Notably, Nebraska is ranked as the fourth windiest state in the United States, thus there is an opportunity to generate much electricity from wind in the future (see Geluso and Geluso 2016). There is a need for a better understanding of the migratory patterns for this species in the Great Plains, as research-

Figure 1. A deceased Hoary Bat (*Aeorestes cinereus*) discovered on 25 December 2018 beneath trees at the headquarters of Fawn Lake Ranch in western Cherry County, Nebraska (42.4989°N, 101.9028°W). Photograph by John Halstead.

ers recently demonstrated that Hoary Bats might face large-scale declines, up to 90%, in the next 50 years due to fatalities associated with turbines at wind-energy facilities (Frick et al. 2017).

***Myotis ciliolabrum* (Merriam, 1886)**
Western Small-footed Myotis

The Western Small-footed Myotis (*Myotis ciliolabrum*) is known from western parts of Nebraska (Benedict 2004). Easternmost records in the state are reported from Garden County (Benedict et al. 2000), Keya Paha County (Czaplewski et al. 1979), and Thomas County (Geluso 2006).

On 8 September 2017, two females were captured night roosting in an outbuilding at the Niobrara Valley Preserve in Brown County, Nebraska (The Nature Conservancy, Headquarters, 42.78363°N, 100.02604°W, NAD 83). Both individuals were captured by hand. One individual, which contained much subcutaneous fat, was kept as a voucher specimen (FHSM #43482). This individual represents one of the latest seasonal observations from Nebraska (Jones 1964; Geluso and Geluso 2016), as the latest observation of a non-hibernating individual was captured on 4 November from Scotts Bluff County in the Wildcat Hills (Geluso et al. 2013). The nearest published record for this species is from 15.5 km to the northwest in Keya Paha County (1.6 km [1 mi] S, 29.0 km [18 mi] E Valentine) (Czaplewski et al. 1979). The record presented herein represents the easternmost record of occurrence known from Nebraska.

ORDER RODENTIA
Family Cricetidae
***Microtus ochrogaster* (Wagner, 1842)**
Prairie Vole

The distribution of the Prairie Vole (*Microtus ochrogaster*) spans across South Dakota, but many counties lack records of observation (Higgins et al. 2002). On 21 June 2019, one juvenile male and two adult males were captured in a grassy roadside right-of-way in Todd County, South Dakota (32.6 km S, 19.8 km E Mission, 43.01303°N, 100.4132°W, WGS 84). One adult male was kept as a voucher (FHSM #43484). One adult female and one juvenile male also were captured from another roadside right-of-way in the county (43.00284°N, 100.35408°W, WGS 84). All three surrounding counties in South Dakota (Bennett, Mellette, and Tripp) have published records (Higgins et al. 2002).

***Neotoma floridana* (Ord, 1818)**
Eastern Woodrat

Three subspecies of Eastern Woodrats (*Neotoma floridana*) occur in Nebraska. The northernmost subspecies, Bailey's Eastern Woodrat (*N. f. baileyi*), occurs along the Niobrara River and its tributaries in north-central Nebraska (Graham et al. 2012). Previously, Graham et al. (2012) captured woodrats in an abandoned homestead in northern Cherry County (4.8 km N, 1.5 km E Sparks, 42.98453°N, 100.23475°W). The homestead is on flat tablelands away from the Niobrara River. On 21 June 2019, no woodrats or sign of woodrats were observed at this location, nor in a woodlot just to the north in South Dakota (42.99968°N, 100.22867°W). It is unclear why Eastern Woodrats are now absent from the abandoned homestead in Nebraska. These results suggest that such sites away from the Niobrara River valley might only occasionally allow for occupancy of this species. An additional site in Tripp County, South Dakota, did not contain woodrats in forested riparian habitats along Lute Creek (43.02198°N, 99.59303°W). Occurrence of Eastern Woodrats in South Dakota would represent a state record. In Nebraska, *N. f. baileyi* is considered a species in need of conservation, with little information known about this endemic subspecies in the state (Schneider et al. 2018).

***Ondatra zibethicus* (Linnaeus, 1766)**
Common Muskrat

The Common Muskrat (*Ondatra zibethicus*) is a semi-aquatic species that inhabits areas with permanent water throughout Nebraska (Jones 1964). With waterproof underfur, a long laterally compressed tail, and partly webbed hind feet, this species is particularly adapted for swimming (Jones 1964). Additionally, the species has a heavyset body supported by short legs (Jones 1964). On 14 May 2019, it was interesting to document two individuals in trees adjacent to the edge of a lake in the Sandhills of western Cherry County, Nebraska (42.5182°N, 101.9879°W, WGS 84; Fig. 2). These two individuals were about 1–2 m above the

Figure 2. Photograph of a Common Muskrat (*Ondatra zibethicus*) in a tree along the edge of a lake in the Sandhills of western Cherry County, Nebraska (42.5182°N, 101.9879°W; 14 May 2019). Photograph by Keith Geluso.

ground. It is unclear why Common Muskrats would climb trees, but that summer the region had an unusual amount of rain with lake level increasing greatly. Accounts on the natural history for *O. zibethicus* do not mention the ability or interest of this species climbing trees (Willner et al. 1980; Jones et al. 1983).

***Peromyscus leucopus* (Rafinesque, 1818)**
White-footed Deermouse

In Nebraska, the White-footed Deermouse (*Peromyscus leucopus*) is a woodland species, inhabiting riparian areas, eastern deciduous forests, hedgerows, and patches of Smooth Sumac (*Rhus glabra*) and American Plum (*Prunus americana*) (Jones 1964; Jones et al. 1983). The species occurs across the eastern two-thirds of Nebraska and the northern tier of counties along the Niobrara River into the Pine Ridge region of northwestern Nebraska (Jones 1964; Benedict et al. 2000). In recent decades, *P. leucopus* has expanded its distribution westward through forested habitats associated with the Platte and Republican rivers (Benedict et al. 2000). In the mainly treeless expanses of the Sandhills of Nebraska, *P. leucopus* is known from eastern parts of the region only as far west as the Valentine National Wildlife Refuge (Bogan and Ramotnik 1995) and Bessey District of the Nebraska National Forest (Manning and Geluso 1989). In the eastern Sandhills, *P. leucopus* has been documented using shelterbelts, tree plantations of mainly Eastern Redcedar (*Juniperus virginiana*), and riparian forests (Manning and Geluso 1989; Spanel and Geluso 2018).

On 26 June 2019, four *P. leucopus* (three females and one male) were captured in a small patch of Eastern Redcedars (52.7 km S, 5.4 km W Merriman, 42.44533°N, 101.76616°W, NAD 83) at Fawn Lake Ranch in western Cherry County, Nebraska. Individuals were captured in Sherman live traps (H.B. Sherman Traps, Tallahassee, FL). One female was pregnant (FHSM #43488) and the other three, which were released, were juveniles or sub-adults, demonstrating

evidence of a reproducing population on the ranch. On 28 July 2020, an additional four *P. leucopus* were captured in another small patch of Eastern Redcedars on the ranch (50.9 km S, 7.3 km W Merriman, 42.46463°N, 101.79010°W, NAD 83), including one adult scrotal male (FHSM #43542) and three adult females (FHSM #43543). The female kept as a voucher specimen was pregnant (1 R, 3 L, uterine swellings 4 mm in length).

Captures of mice were located about 11–13 km from the Snake River, a tributary of the Niobrara River. Along the Snake River, north-facing slopes contained patches of Eastern Redcedars and the narrow river valley contained scattered deciduous trees. Between Fawn Lake Ranch and wooded habitats along the Snake River, there are no contiguous wooded habitats. The ranch has few patches of human-planted Eastern Redcedar and Ponderosa Pines used as windbreaks. The ranch consists mostly of upland grasslands and low-lying wet meadows. A few Plains Cottonwoods and willows (*Salix*) occur around lake margins and wetlands, as well as the few homesteads.

Peromyscus leucopus likely has expanded naturally into these small wooded habitats on the ranch from wooded habitats to the north, such as the Snake and Niobrara rivers, the nearest wooded and forested areas. Individuals potentially used patches of American Plums and wooded shelterbelts to reach the ranch. Alternatively, individuals might have been moved inadvertently in hay bales or other items from other ranches within the known distribution of the species (e.g., Benedict et al. 2000; Geluso and Forsberg 2017). Further surveys would be informative as to the current distribution of this woodland species in western and interior parts of the Sandhill Region of Nebraska.

***Reithrodontomys montanus* (Baird, 1855)**
Plains Harvest Mouse

The Plains Harvest Mouse (*Reithrodontomys montanus*) is an uncommon species that inhabits uplands across Nebraska (Jones 1964). Herein, diurnal and crepuscular observations for this mouse are presented along with five new county records: Buffalo, Dawson, Loup, Phelps, and Scotts Bluff. Four of five county records also represent hand captures during the evening or morning.

A total of five individuals were captured by hand in the evening prior to sunset (n = 4) or in the morning after sunrise (n = 1). The individual that does not represent a county record was captured and released on 29 September 2007 at Crescent Lake National Wildlife Refuge, Garden County, Nebraska (41.7623°N, 102.4354°W, WGS 84). See county records below for specific details on the other diurnal captures by hand. Information on diurnal activity appears novel for this species in the literature (Jones et al. 1983; Wilkins 1986). Plains Harvest Mice reportedly are captured infrequently in traps compared to the Western Harvest Mouse (*Reithrodontomys megalotis*; Jones 1964; Geluso and Wright 2019). Another explanation for their infrequency in traps might relate to their diurnal and crepuscular activity in the morning and evening.

On 22 April 2017, an adult individual was captured by hand in the morning in an area with sparse herbaceous cover in the floodplain of the Platte River in Buffalo County, Nebraska (Kearney High School, Kearney, 40.6785°N, 99.1171°W, WGS 84; Fig. 3). On 6 November 2020, an adult female was captured by hand in sparsely vegetated floodplain habitat along the Platte River in Dawson County, Nebraska (Jeffrey Island, 6.0 km S, 6.3 km W Overton Post Office; 40.68563°N, 99.61306°W, NAD 83; FHSM #43547). The area was situated above the sub-irrigated soils adjacent to the river but below an extensive area of land dominated by dense sod-forming grasses. The area was in the active flood zone. The friable substrata was sandy but contained some gravel and lacked sod-forming grasses. Dominant vegetation included Foxtail (*Setaria*), Common Sunflower (*Helianthus annuus*), and Field Sagewort (*Artemisia campestris caudata*). Other small mammals captured the next morning in the immediate area consisted of Ord's Kangaroo Rats (*Dipodomys ordii*) and North American Deermice. On 17 September 2016, a juvenile female was captured by hand in a disturbed area with mowed herbaceous vegetation in Loup County, Nebraska (18.8 km N, 6.0 km E Taylor, 41.93898°N, 99.30629°W, WGS 84; FHSM #43492) near ranch buildings and corrals. Substrata of the site was sandy. On 4 November 2006, a female was captured by hand in an area dominated by Foxtail, Sideoats Grama (*Bouteloua curtipendula*), and Indiangrass (*Sorghastrum nutans*) in Phelps County, Nebraska (Lynder Federal Waterfowl Production Area,

Figure 3. A Plains Harvest Mouse (*Reithrodontomys montanus*) captured on 22 April 2017 in Buffalo County, Nebraska (40.6785°N, 99.1171°W). The individual was captured by hand in a grassy area after sunrise, exhibiting diurnal activity for this species. Photograph by Keith Geluso.

40.54647°N, 99.53098°W, NAD 83). On 3 July 2002, a scrotal male was captured in a Sherman live trap in an area with sparse grasses, sage (*Artemisia* spp.), and prickly pear (*Opuntia* spp.) in Scotts Bluff County, Nebraska (Lake Alice Area, North Platte National Wildlife Refuge, 41.9793°N, 103.5978°W, NAD 27; MSB #124414). Other species captured in the trap line included *D. ordii*, *R. megalotis*, and Hispid Pocket Mice (*Chaetodipus hispidus*). These records help to fill in counties lacking records for this species in Nebraska (Jones 1964; Geluso and Wright 2019).

Sigmodon hispidus **Say and Ord, 1825**
Hispid Cotton Rat

The Hispid Cotton Rat (*Sigmodon hispidus*) is a relatively recent resident to Nebraska, as the species first was documented in the state in 1958, and its distribution has been expanding northward in the Great Plains during the last century (Cockrum 1948; Jones 1960; Jones et al. 1983; Wright et al. 2010). Currently, Nebraska represents the northern and northwestern-most extent for distribution of Hispid Cotton Rats in North America (Wright et al. 2010; Frisch et al. 2015). Expansion northward and westward has been noted in the state since then, especially in southwestern parts of the state (Farney 1975; Wright et al. 2010; Wills et al. 2011; Frisch et al. 2015). With no evidence of a northern barrier for the species due to habitat or other environmental factors (Jones et al. 1983), continued sampling is necessary to observe whether *S. hispidus* will continue its northward and westward expansion in the state. Herein, a record is reported for *S. hispidus* in Nebraska that represents the northernmost record throughout its range in North America.

On 14 July 2017, a Hispid Cotton Rat was captured near North Platte, Lincoln County, Nebraska (Indian Hills subdivision, 6.3 km [4 mi] S, 1.6 km [1 mi] W North Platte, 41.08086°N, 100.78711°W, WGS 84; UNSM ZM #31038). The female contained four embryos (2L, 2R, crown rump length 38 mm), sug-

gesting a reproducing population in the area. In early May 2019, evidence of *S. hispidus* was not observed by searching for diagnostic wide runways with grass clippings as well as trapping for small mammals in Keith County (Ogallala Nature Park and Ogallala Strip State Wildlife Management Area) and Deuel County (Goldeneye Lake State Wildlife Management Area).

***Synaptomys cooperi* Baird, 1857**
Southern Bog Lemming

The Southern Bog Lemming (*Synaptomys cooperi*) occurs in eastern and southern Nebraska, albeit relatively few records are known from the state (Jones 1964; Benedict et al. 2000). Most individuals have been captured in dense vegetative litter with tall herbaceous overstory, such as sunflowers, Smooth Sumac, and American Plum (Jones 1964; Benedict et al. 2000). Herein, three new county records are presented: Franklin, Harlan, and Jefferson.

On 13 December 2008, one male was captured in a roadside ditch containing Indiangrass, Switchgrass (*Panicum virgatum*), Smooth Brome (*Bromus inermis*), and horsetails (*Equisetum* spp.) in Franklin County (1.0 km [0.6 mi] W Riverton, 40.0892°N, 98.7662°W, NAD 83; UNSM ZM #29914). Other species captured in the trap line included Elliot's Short-tailed Shrew (*Blarina hylophaga*), *P. maniculatus*, and *S. hispidus*. On 1 April 2007, an adult male was captured in a grassy roadside slope containing Indiangrass and Switchgrass in Harlan County (2.25 km [1.4 mi] S Hwy 189, US Hwy 183, 40.0324°N, 99.3678°W, NAD 83; UNSM ZM #29334). Other species captured in the trap line included *B. hylophaga*, *M. ochrogaster*, *P. maniculatus*, *R. megalotis*, and *S. hispidus*. On 26 November 2008, a non-reproductive female was captured in an upland grassland that contained various grasses and forbs, including sunflowers and Indiangrass in Harlan County (Harlan County Reservoir, near Prairie Dog Creek, 40.0199°N, 99.3645°W, NAD 83; UNSM ZM #29912). Other species captured in the trap line included *B. hylophaga*, *P. maniculatus*, *R. megalotis*, and *S. hispidus*. On 30 April 2006, one male (UNSM ZM #29353) and one pregnant female (UNSM ZM #29352, 2 embryos with uterine swellings 7 mm in length) were captured in what appeared to be a reestablished prairie with tall grasses in Jefferson County (0.8 km [0.5 mi] S, 12.9 km [8 mi] W Endicott, Rose Creek State Wildlife Management Area, 40.0762°N, 97.2374°W, NAD 83). Other species captured in the trap line included *P. leucopus* and *P. maniculatus*. These observations increase the knowledge on distribution of this species in southern Nebraska, as few records were known from the southern tier of counties in the state (Jones 1964; Benedict et al. 2000).

Family Dipodidae
***Zapus hudsonius* (Zimmermann, 1780)**
Meadow Jumping Mouse

The Meadow Jumping Mouse (*Zapus hudsonius*) inhabits mesic herbaceous environs in Nebraska, especially riparian areas and wetland margins (Jones 1964). Although its distribution spans across most of the state, few records exist in western and southern portions of Nebraska (Jones 1964; Jones et al. 1983). In the Sandhills of Nebraska and southern South Dakota, *Z. hudsonius* is limited to mesic areas immediately surrounding lakes and rivers (Jones 1964; Wilhelm et al. 1981; Bogan et al. 2004). In eastern parts of the Sandhills, *Z. hudsonius* is known from the Bessey District of the National Forest Service along the Middle Loup and Dismal rivers (Manning and Geluso 1989) and Fort Niobrara and Valentine National Wildlife refuges in eastern Cherry County (Bogan and Romatnik 1995). In southwestern parts of the Sandhills, *Z. hudsonius* occurs at Crescent Lake National Wildlife Refuge (Bogan et al. 2004). This species is not known from western parts of the Sandhills in Nebraska (Jones 1964). Additionally, in southern Nebraska, there are no published records along the Republican River (Jones 1964).

Meadow Jumping Mice can be recognized in part by long tails and long hind feet, which are used for jumping to escape predators (Whitaker 1972; Jones et al. 1983). Whitaker (1963) also reported that individuals (*Z. h. americanus*) climb grass stems to reach seed heads in captivity. Recently in New Mexico, another subspecies (*Z. h. luteus*) used its long tail and feet to climb and move through herbaceous vegetation to feed on seed heads in natural habitats (Wright and Frey 2014). Herein, data are presented for the first record from western Cherry County, first record for Grant County, first record along the Republican River, and first report of climbing for *Z. h. pallidus*.

In early June 2019, two Meadow Jumping Mice were observed in herbaceous vegetation during the day on the margin of a small lake at Fawn Lake Ranch in the western Sandhills of Cherry County, Nebraska. On 26 June 2019, one adult female jumping mouse was captured (48.2 km S, 14.7 km W Merriman, 42.48645°N, 101.88661°W; NAD 83; FHSM #43489). Other species captured in the trap line included the Meadow Vole (*Microtus pennsylvanicus*) and Common Gartersnake (*Thamnophis sirtalis*). On 20 June 2020, one lactating female jumping mouse (FHSM #43544) and one *M. pennsylvanicus* were captured at the same site. On 30 August 2020, an adult female was captured by hand at night along the edge of Frye Lake in Grant County while conducting an amphibian survey at the lake (Frye Lake State Wildlife Management Area, 1.8 km N, 0.7 km E Hyannis Post Office, 42.0162°N, 101.7530°W; WGS 84; FHSM #43541). All individuals at both sites were captured within 5 m of lake edges in mesic herbaceous vegetation. On 14 September 2008, a female was captured in an upland grassland area in Harlan County, Nebraska (Harlan County Reservoir, near Prairie Dog Creek, 40.0199°N, 99.3645°W, NAD 83). The capture site was about 400 m from the creek, and dominant vegetation at the site included Smooth Brome, Indiangrass, sunflowers (*Helianthus* spp.), and Switchgrass. Other species captured in the trap line included *C. hispidus*, *M. ochrogaster*, *P. maniculatus*, *R. megalotis*, and *S. hispidus*.

Observations from western Cherry County confirm that *Z. hudsonius* occurs in western reaches of the Sandhills (Jones 1964; Jones et al. 1983). The nearest published record in the Sandhills to the locality at Fawn Lake Ranch is from 68 km to the north northeast at Lacreek National Wildlife Refuge, Bennett County, South Dakota (Wilhelm et al. 1981). Although Jones (1964) did not report *Z. hudsonius* farther west in the Pine Ridge of extreme northwestern Nebraska, Freeman et al. (1993) mentions this species was taken south of the Pine Ridge near Rushville along Rush Creek, a tributary of Niobrara River, in grassland habitats that resembled the Sandhills prairie (UNAM ZM #17477). The site along Rush Creek is about 52 km from the site at Fawn Lake Ranch. The Pine Ridge Region of Nebraska is near the Black Hills of South Dakota where another subspecies (*Z. h. campestris*) occurs (Turner 1974; King et al. 2006). More surveys are needed in the western reaches of the state to better understand the distribution of this species. If *Z. hudsonius* occurs in the Pine Ridge region of the state, then it will be interesting to determine the subspecies as either *Z. h. campestris* or *Z. h. pallidus*. The record from Harlan County is the first in the county as well as along the Republican River in Nebraska. The species might occur farther west along this waterway in the state.

On 17 August 2019, one *Z. h. pallidus* was observed at night feeding on the inflorescence of Reed Canarygrass (*Phalaris arundinacea*) at the margin of a small lake at Fawn Lake Ranch (42.48645°N, 101.88661°W; NAD 83). The individual was about 1 m off the ground with its tail pressing against grass for support. This observation demonstrates that this subspecies also climbs herbaceous vegetation to seek food resources (Wright and Frey 2014).

Family Erethizontidae
***Erethizon dorsatum* (Linnaeus, 1758)**
North American Porcupine

The North American Porcupine (*Erethizon dorsatum*) is distributed throughout Nebraska and the Northern Great Plains (Jones 1964; Jones et al. 1983). This species generally inhabits forested habitats but can range into grasslands with nearby wooded riparian areas (Jones et al. 1983). On 30 January 2021, an individual was observed deceased along the shoulder of Hwy 30 in western Kimball County, Nebraska (41.240240°N, 103.696412°W; FHSM #43555). This individual was 0.52 km from Lodgepole Creek, a small tributary of the South Platte River, that has a riparian area dense with Roughleaf Dogwood (*Cornus drummondii*) and patches of deciduous trees. The closest records of occurrence in Nebraska are to the north in Banner County and to the northeast in Morrill County (Jones 1964). This record represents the first record of *E. dorsatum* from Kimball County.

Family Heteromyidae
***Dipodomys ordii* Woodhouse, 1853**
Ord's Kangaroo Rat

Ord's Kangaroo Rat (*Dipodomys ordii*) is distributed across southern and western parts of South Dakota (Higgins et al. 2002). On 22 June 2019, a scrotal male was captured along a roadside in southern Tripp County, South Dakota (42.9991°N, 100.06755°W, NAD 83;

FHSM #43483). Only two Sherman live traps were set, as diagnostic runways and holes were observed in the area. Another individual was captured and released at a nearby locality with limited traps (43.05364°N, 100.06779°W, NAD 83). Ord's Kangaroo Rats are known from counties to the west (Todd County) and east (Gregory County) of Tripp County (Higgins et al. 2002).

Family Sciuridae
***Poliocitellus franklinii* (Sabine, 1822)**
Franklin's Ground Squirrel

In recent decades, southern and eastern populations of Franklin's Ground Squirrel (*Poliocitellus franklinii*) have declined throughout its distribution in North America, including Illinois, Iowa, Kansas, Missouri, and Nebraska (Martin et al. 2003; Huebschman 2007). There has not been a single specimen of Franklin's Ground Squirrels reported in Kansas since 1986 (Schmidt et al. 2018; VertNet.org) and no records from western Nebraska since 2001 (Phelps County, UNSM ZM# 28053). Historically, Franklin's Ground Squirrel occurred in tall-grass prairies throughout central and eastern Nebraska (Jones 1964). In more westerly parts of Nebraska, occurrences are associated with river systems, such as the Elkhorn, Loup, Niobrara, and Platte (Jones 1964).

On 20 September 2020, a deceased male individual was salvaged from a roadway in Phelps County, Nebraska (748 Road, 7.6 km S, 4.3 km W Overton Post Office, 40.67107°N, 99.58925°W; NAD 83; FHSM #43545). This area was in the floodplain of the Platte River. Another individual was observed crossing the roadway about a week before in the same vicinity. On the north side of the roadway, the right-of-way was wide with a steep bank and mixture of grasses and forbs. Based on the late date of occurrence, the individual potentially was a young of the year, as adult males enter hibernation as early as July (Jones et al. 1983). Individuals rarely have been observed in the south-central Nebraska during the last decade by the authors. More studies are needed to evaluate the current status of this species in Nebraska, as this area in Phelps County might represent the westernmost extant population in the state and in the southwestern parts of its distribution in North America.

***Xerospermophilus spilosoma* Bennett, 1833**
Spotted Ground Squirrel

The Spotted Ground Squirrel (*Xerospermophilus spilosoma*) is known from central and western parts of Nebraska (Jones 1964). The species inhabits dry sandy areas. On 2 July 2002, a non-reproductive female was captured in an open area containing scattered sage (*Artemisia*) and short grasses in Scotts Bluff County (Lake Alice Area, N of Highline Canal, North Platte National Wildlife Refuge, 41.9865°N, 103.5962°W, NAD 27; MSB #124406). Other species captured in the trap line included *D. ordii*, Northern Grasshopper Mouse (*Onychomys leucogaster*), Plains Pocket Mouse (*Perognathus flavescens*), *R. megalotis*, and Silky Pocket Mouse (*Perognathus flavus*). On 9 July 2002, a scrotal male was captured in a grassy upland area in Scotts Bluff County (Lake Minatare Area, North Platte National Wildlife Refuge, 41.9387°N, 103.5113°W, NAD 27; MSB #124432). Other species captured in the trap line included *O. leucogaster* and *P. flavus*. On 10 July 2002, a female was captured and released in a sparsely vegetated area with a few grasses in Scotts Bluff County (Lake Alice Area, North Platte National Wildlife Refuge, 41.9836°N, 103.5964°W, NAD 27). Other species captured included *C. hispidus*, *D. ordii*, and *P. maniculatus*. Records presented herein represent the first observations for the county. The species is known from the three surrounding counties in Nebraska: Banner, Morrill, and Sioux (Jones 1964).

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LITERATURE CITED

Baird, A. B., J. K. Braun, M. A. Mares, J. C. Morales, J. C. Patton, C. Q. Tran, and J. W. Bickham. 2015. Molecular systematic revision of tree bats (Lasiurini): doubling the native mammals of the Hawaiian Islands. Journal of Mammalogy 96:1255–1274.

Benedict, R. A. 2004. Reproductive activity and distribution of bats in Nebraska. Western North American Naturalist 64:231–248.

Benedict, R. A., H. H. Genoways, and P. W. Freeman. 2000. Shifting distributional patterns of mammals in Nebraska. Transactions of the Nebraska Academy of Sciences 26:55–84.

Best, T. L., and J. L. Hunt. 2020. Mammals of the southeastern United States. The University of Alabama Press, Tuscaloosa, Alabama.

Bogan, M. A., and C. A. Ramotnik. 1995. The mammals. Pp. 140–186 in A biological survey of Fort Niobrara and Valentine National Wildlife Refuges (M. A. Bogan, ed.). Final Report to the National Biological Service, Midcontinent Ecological Science Center, Fort Collins, Colorado.

Bogan, M. A., K. Geluso, and J. A. White. 2004. Mammalian inventories for two National Wildlife Refuges in Nebraska, 2001–2002 [Crescent Lake National Wildlife Refuge and North Platte National Wildlife Refuge]. Final Report to the Division of Wildlife Refuges, Region 6, U.S. Fish and Wildlife Service, Lakewood, Colorado, 92 pp.

Bond, R. M. 1940. Food habits of horned owls in the Pahranagat Valley, Nevada. The Condor 42:164–165.

Bradley, R. D., L. K. Ammerman, R. J. Baker, L. C. Bradley, J. A. Cook, R. C. Dowler, C. Jones, D. J. Schmidly, F. B. Stangl, Jr., R. A. Van Den Bussche, and B. Würsig. 2014. Revised checklist of North American mammals north of Mexico, 2014. Occasional Papers, Museum of Texas Tech University 327:1–27.

Cockrum, E. L. 1948. The distribution of the Hispid Cotton Rat in Kansas. Transactions of the Kansas Academy of Science 51:306-312.

Czaplewski, N. J., J. P. Farney, J. K. Jones, Jr., and J. D. Druecker. 1979. Synopsis of bats of Nebraska. Occasional Papers, Museum of Texas Tech University 61:1–24.

Farney, J. P. 1975. Natural history and northward dispersal of the Hispid Cotton Rat in Nebraska. Platte Valley Review 3:11–16.

Forrester, A. J., B. C. Peterson, J. M. Ringenberg, S. M. Schlater, and K. Geluso. 2019. Continued westward expansion of woodchucks (*Marmota monax*) in Nebraska. Western North American Naturalist 79:574–580.

Freeman, P. W., J. D. Druecker, and S. Tvrz. 1993. *Sorex merriami* in Nebraska. The Prairie Naturalist 25:291–294.

Frick, W. F., E. F. Baerwald, J. F. Pollock, R. M. R. Barclay, J. A. Szymanski, T. J. Weller, A. L. Russell, S. C. Loeb, R. A. Medellin, and L. P. McGuire. 2017. Fatalities at wind turbines may threaten population viability of a migratory bat. Biological Conservation 209:172–177.

Frisch, J. D., K. Geluso, and J. T. Springer. 2015. Distributional expansion of the Hispid Cotton Rat (*Sigmodon hispidus*) into Dawson County, Nebraska. Transactions of the Nebraska Academy of Sciences 35:12–14.

Geluso K. 2006. Bats in a human-made forest of central Nebraska. The Prairie Naturalist 38:13–23.

Geluso, K., and M. L. Forsberg. 2017. Hitching a ride: first record of a Least Chipmunk (*Tamias minimus*) in eastern Nebraska. Transactions of the Nebraska Academy of Science 37:28–31.

Geluso, K., and G. D. Wright. 2019. Status of the Plains Harvest Mouse (*Reithrodontomys montanus griseus*) in eastern Nebraska. Transactions of the Nebraska Academy of Sciences 39:10–16.

Geluso, K. N., and K. Geluso. 2016. Bats of Kimball and Cheyenne counties in the panhandle of Nebraska. Pp. 183–200 in Contributions in natural history: a memorial volume in honor of Clyde Jones (R. W. Manning, J. R. Goetze, and F. D. Yancey, II, eds.). Special Publications, Museum of Texas Tech University 65:1–273.

Geluso, K., J. J. Huebschman, and K. N. Geluso. 2013. Bats of the Wildcat Hills and surrounding areas in western Nebraska. Monographs of the Western North American Naturalist 6:20–42.

Geluso, K., E. C. Keele, N. M. Pauley, I. R. Gomez, and S. P. Tye. 2018. Night-roosting behaviors for the Northern Long-eared Myotis (*Myotis septentrionalis*) under a bridge revealed by time-lapse photography. American Midland Naturalist 179:287–293.

Graham, Z. R., K. Geluso, and R. A. Benedict. 2012. Notes on the distribution of Bailey's Eastern Woodrat

(*Neotoma floridana baileyi*) in Nebraska. Western North American Naturalist 72:252–256.

Higgins, K. E., E. D. Stukel, J. M. Goulet, and D. C. Backlund. 2002. Wild mammals of South Dakota. Second Edition. South Dakota Department of Game, Fish, and Parks, Pierre, South Dakota.

Huebschman, J. J. 2007. Distribution, abundance, and habitat associations of Franklin's Ground Squirrel (*Spermophilus franklinii* Sabine 1822). Illinois Natural History Survey Bulletin 38:1–57.

Johnson, O. J., and K. Geluso. 2017. Distributional and reproductive records of bats from south-central Nebraska. Occasional Papers, Museum of Texas Tech University 347:1–15.

Jones, J. K., Jr. 1960. The Hispid Cotton Rat in Nebraska. Journal of Mammalogy 41:132.

Jones, J. K., Jr. 1964. Distribution and taxonomy of mammals of Nebraska. Publications of the Museum of Natural History, University of Kansas 16:1–356.

Jones, J. K., Jr., D. M. Armstrong, R. S. Hoffmann, and C. Jones. 1983. Mammals of the northern Great Plains. University of Nebraska Press, Lincoln, Nebraska.

King, T. L., J. F. Switzer, C. L. Morrison, M. S. Eackles, C. C. Young, B. A. Lubinski, and P. Cryan. 2006. Comprehensive genetic analyses reveal evolutionary distinction of a mouse (*Zapus hudsonius preblei*) proposed for delisting from the US Endangered Species Act. Molecular Ecology 15:4331–4359.

Manning, R. W., and K. N. Geluso. 1989. Habitat utilization of mammals in a man-made forest in the Sandhill Region of Nebraska. Occasional Papers, Museum of Texas Tech University 131:1–34.

Martin, J. M., E. J. Heske, and J. E. Hofman. 2003. Franklin's Ground Squirrel (*Spermophilus franklinii*) in Illinois: a declining prairie mammal? American Midland Naturalist 150:130–138.

Mattson, T. A. 1995. Owl predation on a Silver-haired Bat. The Prairie Naturalist 27:127.

Mollhoff, W. J. 2018. Northern Saw-whet Owl (*Aegolius acadicus*) nest box project: the first seven years. The Nebraska Bird Review 86:168–174.

Nyffeler, M., and M. Knörnschild. 2013. Bat predation by spiders. PLOS ONE 8: e5.8120

Roehrs, Z. P., R. A. Benedict, T. E. Labedz, and H. H. Genoways. 2021. Observations on the distribution and status of selected Nebraska mammals. Transactions of the Nebraska Academy of Sciences 41:1–28.

Schmidly, D. J., and R. D. Bradley. 2016. The mammals of Texas. Seventh Edition. The University of Texas Press, Austin, Texas.

Schmidt, C. J., E. J. Finck, M. Peek, A. Hope, G. A. Kaufman, D. W. Kaufman, and R. Timm. 2018. Kansas mammal atlas: an on-line reference. Electronic database accessible at https://webapps.fhsu.edu/ksmammal. Accessed: 21 January 2021.

Schneider, R., M. Fritz, J. Jorgensen, S. Schainost, R. Simpson, G. Steinauer, and C. Rothe-Groleau. 2018. Revision of the Tier 1 and 2 lists of species of greatest conservation need: a supplement to the Nebraska Natural Legacy Project State Wildlife Action Plan. The Nebraska Game and Parks Commission, Lincoln, Nebraska.

Spanel, T. J., and K. Geluso. 2018. Small mammals in cornfields and associated peripheral habitats in central Nebraska. Transactions of the Nebraska Academy of Sciences 38:30–35.

Sparks, D. W., K. J. Roberts, and C. Jones. 2000. Vertebrate predators on bats in North America north of Mexico. Pp. 229–241 in Reflections of a naturalist: papers honoring Professor Eugene D. Fleharty. Fort Hays Studies, Special Issue 1. Fort Hays State University, Hays, Kansas.

Turner, R. W. 1974. Mammals of the Black Hills of South Dakota and Wyoming. Miscellaneous Publications of the Museum of Natural History, University of Kansas 60:1–178.

USDA (US Department of Agriculture) NRCS (Natural Resources Conservation Service). 2021. The PLANTS Database (http://plants.usda.gov). Accessed 31 January 2021. National Plant Data Team, Greesboro, NC.

USFWS (US Fish and Wildlife Service). 2015. Endangered and threatened wildlife and plants; threatened species status for the Northern Long-eared Bat with 4(d) rule. Federal Register 80:17974–18033.

Whitaker, J. O., Jr. 1972. Zapus hudsonius. Mammalian Species 11:1–7.

Whitaker, J. O., Jr. 1963. A study of the Meadow Jumping Mouse, *Zapus hudsonius* (Zimmerman), in central New York. Ecological Monographs 33:215–254.

Wilhelm, R. B., J. R. Choate, and J. K. Jones, Jr. 1981. Mammals of Lacreek National Wildlife Refuge, South Dakota. Special Publications, Museum of Texas Tech University 17:1–39.

Wilkins, K. T. 1986. Reithrodontomys montanus. Mammalian Species 257:1–5.

Willner, G. R., G. A. Feldhamer, E. E. Zucker, and J. A. Chapman. 1980. Ondatra zibethicus. Mammalian Species 141:1–8.

Wills, H. D., K. Geluso, E. J. Smitts, J. T. Springer, and W. E. Newton. 2011. Notes on the distribution of Eastern Woodrats and Hispid Cotton Rats in south-central Nebraska. The Prairie Naturalist 43:127–129.

Wright, G. D., and J. K. Frey. 2014. Herbeal feeding behavior of the New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*). Western North American Naturalist 74:231–235.

Wright, G. D., K. Geluso, and R. A. Benedict. 2010. Hispid Cotton Rat (*Sigmodon hispidus*) in Nebraska: distribution, reproduction, and seasonal activity. Western North American Naturalist 70:400–406.

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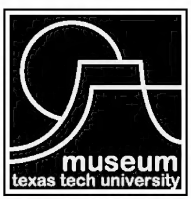

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